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Botanical notes from Bainbridge, Georgia.

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Oaks as weeds.

I suppose it is hardly proper to refer to any plants not herbaceous as weeds. Yet when the planter finds a ligneous plant which is becoming a nuisance and which is fast making itself a pest, he wishes a word which will express his meaning to other people. Seven years ago the plantations of the vicinity contained many open forests, in which pines predominated, and in which the oaks though abundant were rarely thought of. These pines are *P. australis* Michx., *P. Taeda* L. and *P. mitis* Mx. Among these the first greatly predominates. With its long leaves, often 15 to 20 inches long, it adds fully as much to the picturesqueness of the south as does the pendent Spanish moss. It is also a valuable tree, not only for its turpentine and resin, for which it is the center of an important industry, but also for its lumber. To be sure, in the north its enormous weight would not permit it to stand competition with the lighter pines, but here in the south it is used for everything.

Now the oaks are coming in so thick as to obstruct and often to prevent the natural seeding and development of young pines. But this is not all. In a country where the climate is so favorable that cattle need feeding only two or two and a half months during the year, the raising of cattle and other grazing animals is an important industry. Now it happens that the invasion of oaks is so great that they shade so much of the ground as to check and limit the development of grass to a tremendous extent, and it is no longer possible to raise so many cattle to the acre without feeding. At present, the writer has before him a landscape of this description, into which these oaks have intruded within the knowledge of the present generation. Eighteen years ago it was all pine woods. A person could drive in any direction and the black-jack oak was only occasionally met. Even now it is rare to find any black-jack oak of any size. They commenced gradually to enter this territory, at first attracting but little attention. Seven years ago the danger of the black

jack oak invasion was already clearly foreseen, and now they are over many acres so thick as to interlock their branches, though the trees are only ten to fifteen feet high. Even on foot it is at times a nuisance to penetrate through the thicker growths, often several acres in extent.

The invasion seems to be from the north. At Marianna, and along the Appalachicola and Chipola in western Florida, they have not yet become a pest. West of the Flint the country was until lately quite free of them as a nuisance, but within the last several years reports have been coming in of the invasion of also that territory. Pines go deeper for their food. Oaks seem to require more potash and more phosphoric acid. Whatever the reason may be, nature, who has been raising pines for a long time, seems to have determined to quit the business, and has directed her attention to raising oaks. Perhaps the pines have exhausted the soil of certain elements, and have left others favorable to the growth of oaks in excess.

An additional observation must here be recorded. Fire is set in winter to the grass in the woods to act as a natural manure for the coming spring. The pines catch fire more easily, owing to their pitch, and the cambium layer is readily killed by heat. Oaks under similar circumstances suffer much less. A plantation house recently burnt down. Being a log and board house built of the rich pitch pine of the country, the heat was intense for an hour at a distance of a hundred feet. All the pines in the vicinity were killed. Five steps away from the sills of the house in the direction of the draft of the fire are black jack oaks, which have put out fresh branches all along the side of the tree away from the house, and those within a foot of the house are putting out branches from the roots. It was hoped that they were dead. Young fresh oaks are springing up everywhere near the burnt ground. Still this readier resistance to fire by oaks is only a very partial factor. On some plantations forest fires have not been allowed for some years on this account, but the oaks are still advancing. The worst oak in this respect is the black jack oak, *Quercus nigra* L., and it is to this oak that the term *weed* would apply. The Turkey oak, *Q. Catesbaei* Michx., is common but not feared.

Near the above mentioned house stood a pine about eight inches in diameter. A storm had inclined it to about fifteen

degrees from the perpendicular towards the north. Since then (in three years) the upper twenty-five feet of the tree had distinctly curved back towards a perpendicular, being inclined only about seven degrees. That it should have done so considering the thickness of the trunk even at this distance (thirty feet) from the ground seems strange.

A new compass-plant.

A walk through any bit of open woodland in July is certain to reveal the presence of quite a number of plants whose leaves have assumed a more or less vertical, instead of horizontal position, owing to a twist in the petiole, or, if the leaf be sessile, in the lower part of its blade, near the base. This is especially common among the *Compositæ*, where such names as *Sericocarpus tortifolius* Nees, and, possibly, *Solidago tortifolia* Ell. record the fact. A species of *Aster*, with ovate-oblong leaves, having a sessile, cordate base, shows a strong twist of the entire leaf towards the right or towards the left, but often in the same direction over the major portion of the same plant.

In *Sericocarpus tortifolius* the twist is confined to the narrowed base of the leaf; in some plants the twist is such that most of the lower leaves turn their upper surfaces towards the south, while the upper younger leaves do not show this tendency; in other plants even the lower leaves show no regularity as to which side is presented to the sun.

In various species of *Liatris* the twist is confined more or less to the lower half or third of the leaf and the twist is quite regularly in the same direction, so that looking at the plant from above the twist of the leaf blades gives it an effect a little like that of a screw. In general the twist is such that, holding the stem so as to place the leaf to be examined toward the right hand of the spectator, the upper surface of the leaf is directed towards him. *Liatris scariosa* Willd. shows this arrangement and *Liatris graminifolia* Willd. gives the screw-like effect very strongly. Other species of the genus show it. In a less distinct manner *Hypericum angulosum* Michx. shows the twisting of the leaf blades.

What is the meaning of this twisting of the leaf blade? Where the leaf blade is twisted throughout its entire extent the cause may be a little dubious, but where the twisting is confined to the basal portion of the leaf it seems quite evident that the resulting vertical portion of the leaf blade is

of service in evading more or less the full effect of the sun's rays during the hottest part of the day. This is true even of those cases of *Sericocarpus tortifolius*, in which most lower leaves face the south, since the vertical position of the leaf blades places them at an angle to the sun's rays which is more advantageous than a horizontal position would be.

The same result is secured in other plants by simply assuming an erect position. A form of *Linum Virginianum* L. is an interesting variation of this habit. Here the leaves are linear, 11^{mm} long, erect, appressed to the stem, and slightly twisted so as to fit still more closely against the stem, both toward the right and toward the left. The lower side of the leaves is thus exposed and the upper side more or less protected. In its earlier history the plant must have been simply a case of vertical leaves. *Aster adnatus* Nutt. must also at one time have had leaves entirely free from the stem, but erect, and more or less appressed to the same. In that position the lower half of the midrib became adnate to the stem and since then the upper half of the leaf has again resumed a tendency to spread.

It is *Aster concolor* L., however, which is the most interesting of the latter class of plants. Here the upper leaves are erect, appressed to the stem, and rather crowded. Towards the base they are larger, less numerous, and no longer so erect, but have rather an ascending position. They here also show a very marked tendency to place their vertical leaf blades in a north and south plane. This tendency disappears, or rather, is obscured among the more crowded and erect upper leaves. Where exposed to the sun freely the north and south position of the lower leaves is very evident and the plant thus becomes another case of a compass plant.

The case of the compass plant of the western states, *Silphium laciniatum* L., is too well known to require more than mention. A number of years ago, the writer, I think, had occasion to describe in this journal a similar phenomenon in thoroughly exposed plants of the prickly lettuce, *Lactuca Scariola* L. And now *Aster concolor* L., becomes a third. All of these belong to the *Compositæ*. The fact that these phenomena seem confined to those plants which delight in open sunny places, and which grow in the warmest part of the year, gives additional weight to the argument that they show evidence of a tendency to evade the hottest and most direct rays of the sun.

A curious rose.

A neighboring planter, Mr. Griffin, has a rose bush bearing constantly green roses. The calyx is fairly normal. The outer petals are small green simple toothed leaves, in other words, like any small leaflet from a rose leaf. The interior petals become less green, and more pale, and gradually less toothed, the upper teeth remaining the largest. The stamens are linear pale green flat petal-like bodies, abruptly expanded at the top, the outer ones notched at the apex. The achenia, on the contrary, are expanded at the base, and narrowed at the top, forming ovate lanceolate pale petal-like bodies. Of course there are no seeds, and the green roses appear on the same bush from year to year.

Fungi.

The first of July is the middle of the rainy season in the south, which lasts about two months. Florida and adjacent Georgia lie within the area of one of the heaviest rainfalls on this continent. During these months it rains frequently, often for several days. Yet there are almost no fungi of such kinds as would be apt to be found by a student not familiar with microscopic forms. A trip down the Chatahoochee and Appalachicola in May, and another down the Chipola, and through Dead Lakes, revealed almost no fleshy fungi, except a few specimens of a lateral stemmed *Agaricus* on a stump in the lakes. Fleshy fungi are, however, common in December and early January, and are moderately common again in February when the spring flowers begin to be frequent. No attempt was made to keep a record of the same. Prof. W. G. Farlow was so kind as to determine the following species of gasteromycetes for me, which are common late in December: *Rhizopogon rubescens* Tul., *Hydnangium Ravenelii* B. & C., *Lycoperdon acuminatum* Curtis (= *L. leprosum* B. & Rav.), and *Clathrus columnatus* Bosc.

Fossil palmettoes at Alum Bluff, Florida.

While on a geological trip with Prof. Raphael Pumpelly, the writer found that the palmetto leaves and trunks of that locality came from near the base of the middle Miocene Alum Bluff sands, just above the Chipola bed of which it represents the later fresh water facies. Above the sands lies the Chesapeake bed. This makes it probable that the wide spread Grand Gulf group of the lower Mississippi basin, in-

cluding localities providing similar palmetto leaves, also began its history at a date as early as the middle, pre-Chesapeake, Miocene. In this connection it may be of interest to notice that among the strongly washed marine fossils of Chipola age, at Gasteropod Gully, on Roseland Plantation four and one-half miles south of Bainbridge (owned by Prof. Pumpelly and Major T. B. Brooks), were found two land gasteropods, one a *Helix* somewhat resembling *H. adamnis* Dall, and the other four and one-half whorls from the upper part of a *Bulimulus*, similar to *B. Heilprinianus* Dall. In those days of the Chipola Miocene the Gulf Stream had a passage between what was then the island of Florida and the mainland of central Georgia and regions north. Gasteropod Gully must have been near the south shore of this mainland and received its land shells from that direction. The locality at Alum Bluff is also a marine deposit, as is shown by the oysters and other shells not at all so very rare in these Alum Bluff sands. Indeed the Chipola fossils run up into the base of these sands. Some of the oysters occur at higher levels than the plants. The water may, however, have been very shallow and brackish. The locality is a very important one in that it enables the correlation of horizons in the widely extended Grand Gulf deposits, with this more local sandy late Chipola bed. Hitherto there has been no *proof* of their earlier than post-Chesapeake Miocene age. The writer is of the opinion that the Grand Gulf series includes horizons which are equivalent in time to the earliest Miocene or Chattahoochee limestone deposits of Florida and southwestern Georgia, but this is hardly the place to develop this idea.